TITLE: THE EFFECT OF PLANT AGE AND CURING ON CUTICULAR LEAF CHEMICAL LEVELS AND COMPOSITION

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ABSTRACT: Recent work has indicated that the composition of the green leaf cuticular components of tobacco may be of significant importance. The surface diterpenes have been reported to have plant growth-inhibiting properties and to be responsible for insect and blue-mold resistance of some tobacco types. The cuticular sucrose esters of Turkish tobaccos are precursors of major flavor components. The objectives of the research were to determine the levels and composition of these cuticular components as a function of plant age and their fate during flue-curing. In 1981, six tobacco types--NC 2326 [α- and β-duvatriene diol (DVT) producers], Chem Mutant and Bel 61-10 (blue-mold resistant, DVT producers); TI-165 (DVT and sucrose ester producers); NFT (cis-abienol producer); and TI 1112 (budworm resistant)--were grown and cured under normal flue-cured conditions at Oxford, N.C. Young, fully-developed bud leaves (approximately 6") were sampled in the plant bed just before and at 2-, 4-, 6-, 8-, and 10-week intervals after transplanting. The samples were analyzed by glass capillary gas chromatography. For young leaves, the lowest levels of cuticular components were found on plant bed material and, in general, the 10-week sample was the highest. For NC 2326, the α-DVT levels varied from 2.3 $\mu g/cm^2$ in the plant bed to 66 $\mu g/cm^2$ at 10 weeks. Topping appeared to induce highest DVT production. Bel 61-10 tobacco and Chem Mutant plant bed DVT levels were about twice that of the non-resistant tobacco. The sucrose ester levels on TI-165, for example, ranged from 1.0 $\mu g/cm^2$ in the plant bed to 48 $\mu g/cm^2$ at 10 weeks. The cuticular leaf GC profiles as a function of leaf age and curing will be discussed.

REVIEW: This was one of four papers (#47-50) presented at the meeting on the subject of tobacco leaf surface chemistry. Dr. Severson gave a progress report on a three-year collaborative research program designed "to more completely identify cuticular components, to develop methods of rapid quantitation, to determine levels and compositions of surface chemicals of various tobaccos, to determine the relationship that these components have to observed host-plant resistance, and to determine their effects on the smoke flavor of cured leaf."

A comparison was given of the relative amounts of duvatrienediols, mono-ols, oxy-diols + triols, total duvanes, cis-abienol, labdenediol, docosanol, hydrocarbons and sucrose esters in the cuticular wax from green, ripe and cured tobaccos:

Tobacco	Major Cuticular Components	Plant Resistance
NC 2326	Duvanes, Hydrocarbons	control
TI-165	Duvanes, Sucrose Esters, Hydrocarbons	budworm
TI-1112	Hydrocarbons	budworm, hornworm, aphids
NFT	Labdanes, Sucrose Esters, Hydrocarbons	budworm, hornworm, aphids
Bel 61-10	Duvanes, Hydrocarbons	blue-mold
Chem. Mut.	Duvanes, Hydrocarbons	blue-mold

The duvatrienediols comprise 46%-61% of the total duvanes after curing; oxydiols + triols comprise 13%-27% and undoubtedly arise by oxidation of the duvatrienediols. Sucrose esters were found in largest amount in TI-165 and the sucrose esters in the cuticular wax increased significantly after curing TI-165 and NFT tobaccos. Ripe NFT tobacco (the only labdane variety) contained cis-abienol that was drastically reduced in amount by curing; labdenediol present in ripe NFT remained at about the same level after curing. The reason for insect resistance of TI-1112 green tobacco is unknown since its surface wax contains primarily hydrocarbons along with small amounts of the duvatrienediols.

The author reported α- and β-4,8,13-duvatriene-1,3-diols to be major components in duvane-producing tobacco waxes. This agrees with my findings and other literature reports but was contradicted by Chang (Paper #47) who isolated duvatrienediols from tobacco leaf trichomes and reported that the duvatriene-1,5-diols are the major tobacco deterpenes in the tobacco waxes. It is very likely that the duvatriene-1,5-diols formed during the isolation and work-up procedure.

-Reviewed by T. Katz